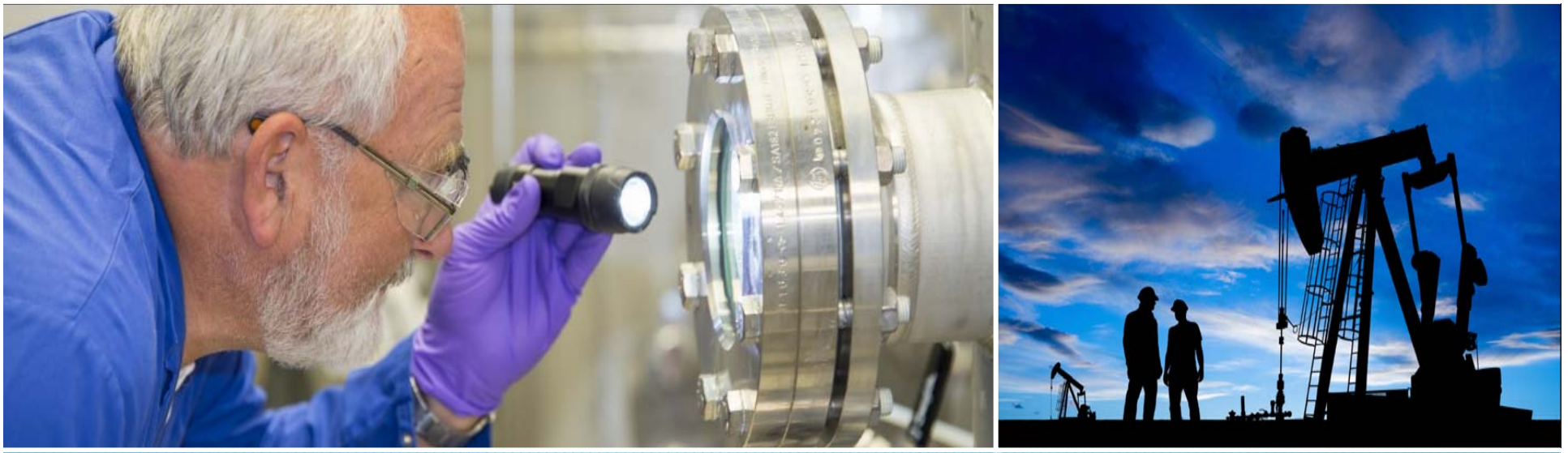


The Clean Resource Innovation Network (CRIN)

July 2017
PTAC and CAPP Outreach



Economic Impact of the Oil and Gas Industry in Canada



The oil and natural gas industry is the largest single private investor in Canada.



DIRECT AND INDIRECT EMPLOYMENT:
425,000 Canadian jobs



ENERGY SECTOR CONTRIBUTION TO GDP:
7.3%



CAPITAL EXPENDITURE:
\$81 billion in 2014,
\$37 billion in 2017



CONTRIBUTION TO GOVERNMENT REVENUES:
\$15 billion/year



SUPPLY CHAIN:
Over **5,000** companies in Canada (outside of Alberta) providing goods and services to the oil sands.

Source: NRCAN, 2016 and CAPP

Who is CRIN?

- CRIN is an industry-led (including SMEs and technology solution providers) network that leverages Canada's strengths in large-scale heavy industrial collaboration
- Aligns research and technology priorities, addressing gaps, and incenting innovation.
- Accelerate and deliver transformative solutions



Vision

The vision of the Clean Resource Innovation Network is to contribute to a future in which:

Canada is a global leader in producing clean hydrocarbon energy from source to end use.



Principles

- ▶ Create an efficient, self-sustaining innovation market
- ▶ Be led by industry, guided by commercial outcomes
- ▶ Be open and inclusive, encouraging broad participation
- ▶ Focus on, and be driven by, impactful innovation projects needed to advance the vision
- ▶ Strengthen existing relationships and extend to other key partners, within an overarching network
- ▶ Be guided by senior leaders in industry, academia, and government to empower innovators
- ▶ Will use, empower, and enable existing innovation planning frameworks and entities



The Governance Structure



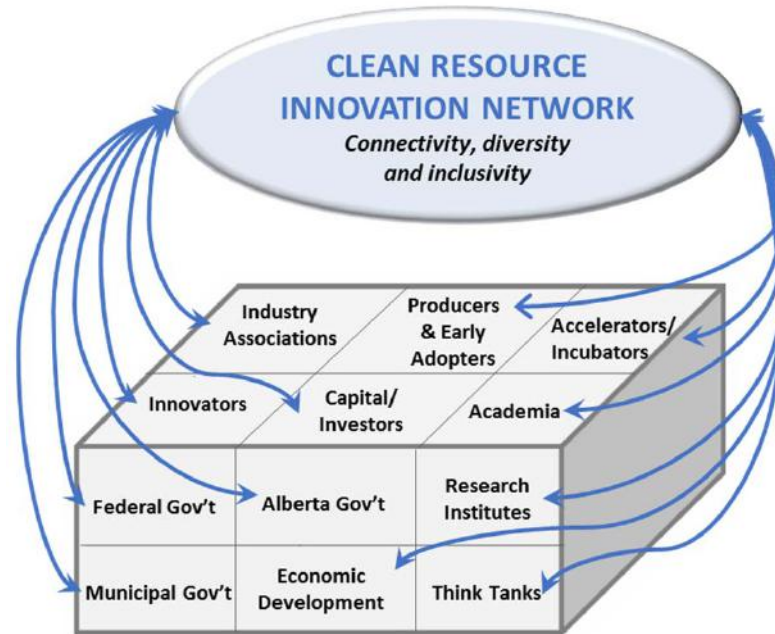
Senior Leaders Forum Members:

- Alberta Economic Development and Trade, Alberta Innovates, BP, Canadian Natural Resources, CAPP, Cenovus Energy, ConocoPhillips Canada, Emissions Reduction Alberta, ISED, MEG Energy, NAL Resources, Nexen, NRC, Shell, StatOil, Suncor Energy, University of Alberta, and University of Calgary.

Steering Committee Representatives:

- Industry: Canadian Natural Resources, Cenovus Energy, ConocoPhillips Canada, Imperial, MEG Energy, Nexen, Shell, Suncor Energy, COSIA, PRNL, PTAC, CAPP
- Government: Calgary Economic Development, Alberta Economic Development and Trade, Alberta Innovates, ISED
- Academia: University of Calgary, University of Alberta
- Finance & Entrepreneurs: BDC, Evok
- SMEs: Innovate Calgary

Clean Resource Innovation Network



CURRENT CRIN MEMBERS AND GROUPS BEING DIRECTLY ENGAGED FOR MEMBERSHIP			
INDUSTRY ASSOCIATIONS <ul style="list-style-type: none"> • COSIA • PRNL • PTAC 	PRODUCERS & EARLY ADOPTERS <ul style="list-style-type: none"> • Oil and gas sector • Other sectors 	ACADEMIA <ul style="list-style-type: none"> • University of Calgary • University of Alberta • NAIT • SAIT • Other institutions across Canada 	CAPITAL/INVESTORS <ul style="list-style-type: none"> • Commercial banks • Global funds • Granting Councils (ERA, SDTC, NSERC, others) • Greentech funds • Oil & gas producers • Venture capital
INNOVATORS <ul style="list-style-type: none"> • Small, medium enterprises (SMEs) • Oil and gas sector 	ACCELERATORS/INCUBATORS <ul style="list-style-type: none"> • Innovate Calgary • Technology Edmonton • Start-up Calgary • Start-up Edmonton 	THINK TANKS <ul style="list-style-type: none"> • Energy Futures Lab 	
FEDERAL GOVERNMENT <ul style="list-style-type: none"> • ISED • NRCAN • Export Development Canada 	ALBERTA GOVERNMENT <ul style="list-style-type: none"> • Alberta Econ. Dev. Trade • Alberta Energy Regulator (AER) 	RESEARCH INSTITUTES <ul style="list-style-type: none"> • Alberta Innovates • CANMET • NRC • SRC 	ECONOMIC DEVELOPMENT <ul style="list-style-type: none"> • Calgary Econ. Dev't. • Edmonton Econ. Dev't.

**This chart is for illustrative purposes to demonstrate broad reach and subject to change.*

A Strong Value Proposition

- ✓ Accelerate solutions
- ✓ Establish industry priorities and connect innovators within the ecosystem and resources.
- ✓ Focus on improved environmental performance and cost competitiveness.
- ✓ This will ensure Canada's continued prosperity with new high-skilled, high-value jobs, economic diversity through spin-offs and enhanced technology exports.



Focus Areas

Theme area	Technology sub theme	Specific technology platform	Reduced water/land footprint	Improved economics & competitiveness	Reduced GHG intensity
1. Environmental Technology		Water technology development centre	H	M	L
		Novel land & wellsite remediation	H	M	
2. Carbon & Economic Competitiveness	Decarbonization	Low to zero carbon hydrocarbon end use		M	H
		Methane monitoring, quantification & abatement		M	H
	Economic and Resource Efficiency	Novel hydrocarbon extraction	M	H	H
		Digital oil and gas	M	H	M
3. Ecosystem Investments	Various	Varied Approaches	← Delivers improvements across all innovation areas →		

L=Low, M=Medium and H=High, refers to the expected impact of the specific technology platform on key strategic objectives.



Analysis of Technology Roadmaps

- Meta-analysis of existing roadmaps
- Articulate industry challenges, identify gaps and duplication, and provide an inventory of potential technology solutions.
- Current technology roadmaps have a strong focus on environmental priorities in the near to medium term.
- Substantial challenges and transformational opportunities exist in the longer term.
- A future state roadmap and strategy should include Canadian leadership for the innovation required to undertake step change improvements in the environmental performance of the oil and gas industry.



Results-Oriented Processes

Leadership

- Executive-level commitment and guidance from across stakeholder groups will ensure sustained action towards a common vision

Priorities

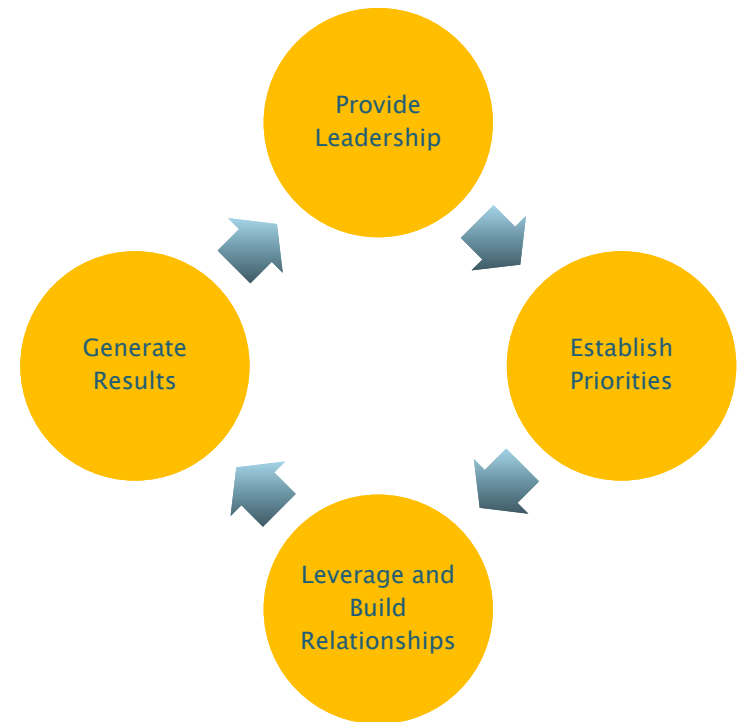
- Industry-led strategic assessments and planning frameworks will ensure that innovation efforts are responsive to and reflective of industry needs

Relationships

- Leveraging a robust global network of expertise, the Network's reach will ensure an active dialogue between innovation researchers, developers, and adopters

Results

- Acceleration of the development and deployment of high-impact innovation with targeted private and public investment





collaboration
is everything

Questions?

